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Locomotives, wagons and their movements [CHD 8:
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Indian Standard
SAFETY CODE FOR PLANT RAILWAYS

**PART II LOCOMOTIVES, WAGONS AND
THEIR MOVEMENT**

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SAFETY CODE FOR PLANT RAILWAYS

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Indian Standard

SAFETY CODE FOR PLANT RAILWAYS

PART II LOCOMOTIVES, WAGONS AND THEIR MOVEMENT

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 25 March 1982, after the draft finalized by the Industrial Safety Advisory Committee had been approved by the Executive Committee.

0.2 A large number of manufacturing units operate plant railways for heavy movement of their goods. The committee, responsible for preparing this standard, therefore, felt that safe practices for plant railways should be codified. This standard has, therefore, been compiled in the light of model rules drafted by Central Labour Institute, Bombay; report of a Subcommittee on rail and road safety in the iron and steel industry; and the corresponding rules framed by the Ministry of Railways, Government of India.

0.3 This standard has two parts. First part, namely, IS : 8218 (Part I)-1976* covered clearances, track, loading and unloading. This standard (Part II) covers safe practices in the design of locomotives, wagons and their movement.

0.4 In the preparation of this standard, assistance has also been derived from the following publications:

Model code of safety regulations for industrial establishments for the guidance of governments and industry, 1969. International Labour Organization.

Accident prevention manual for industrial operations. 6th edition, 1969. National Safety Council, USA.

Report of the subcommittee on rail and road safety in iron and steel industry. 1969. Ministry of Labour.

1. SCOPE

1.1 This standard (Part II) lays down safe practices in respect of design of locomotives, wagons and their movement.

*Safety code for plant railways: Part I Layout.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 8218 (Part I)-1976* shall apply.

3. DESIGN FEATURES FOR SAFETY

3.0 In-built design features of locomotives and wagons for promoting safety should receive maximum consideration. Good field of vision for the driver, and safe means of access are essential.

3.1 Locomotives — Their safe design features should include the following requirements.

3.1.1 Cab windows should be of adequate size and so disposed as to give maximum field of vision.

3.1.2 Outline, shape and positioning of engine cowling (in case of diesel locomotives), should allow maximum space for windows and interfere as little as possible with the vision from the windows.

3.1.3 Shunter's steps should be at four corners of the locomotives. They should be applied proportionately with non-slip treads; and should position relative to the frame and footplate so as to allow the shunter to stand on them and be in the clear. They should also permit the shunter to cross over the locomotive in safety at the end remote from the cab.

3.1.4 Hand rails should be sufficient and properly positioned especially those for use by a shunter when mounting and dismounting from the locomotive.

3.1.5 There should be audible warning system with a distinctive note, with control for directional operation, easily accessible to driver in the normal lookout position.

3.1.6 Operating controls should be in duplicate and arranged so as to be easily handled by the driver from the normal lookout position.

3.1.7 Efficient windscreen wipers of robust construction should be provided.

3.1.8 Buffer beam extensions should be provided to protect shunter's legs, when riding on lower step.

3.1.9 Lifting and jacking pads should be provided at the four corners of the locomotive to assist and make safe re-railing operations.

*Safety code for plant railways: Part I Layout.

3.1.10 Suitable buffers should be provided to reduce intensity of shunting shocks.

3.1.11 Locomotive should be so finished as to include distinctive marking in bright colours of prominent parts in accordance with practice in force and provision of suitable lights for identification at night.

3.2 Wagons — For wagons the following requirement should be provided.

3.2.1 Suitably designed access ladders and hand-holds.

3.2.2 A suitable grilled platform around man-hole opening of oil tank wagons should be provided for safe access of personnel who are required to take dip or inspect the wagons from time to time during decantation.

3.2.3 Couplers should be coupled or uncoupled without the necessity of employees going between wagons. If, however, screw couplers are to be used these should be so designed that the shackle of the screw coupling can be attached to the draw bar hook with sufficient ease. Existing couplings of the simple flat link type incorporating loose vertical pins (top entry) in use of ingot casting are unsafe. These couplings may be converted to lever operated (bottom entry) vertical pin type couplings.

4. PRECAUTIONS FOR SAFETY

4.0 In no circumstances shall any locomotive or train be moved between sunset and sunrise or at any time when there is fog, unless it carries a white headlight and a red rear light.

4.1 Locomotives

4.1.1 Every locomotive shall be provided with efficient brakes, all of which shall be maintained in good working order. Brake shoes shall be examined at suitably fixed intervals and those that are worn out replaced at once.

4.1.2 Water-gauge glasses of every locomotive, whatever be the boiler pressure, shall be protected with substantial glass or metal screens.

4.1.3 It shall be clearly indicated on every locomotive crane in English and language understood by the majority of the workers in the factory, for what mass of load and at what radius the crane is safe.

4.2 Wagons — Every wagon (and passenger coach, if any) shall be provided either with self-acting brakes capable of being applied continuously or with efficient hand brakes which shall be maintained

in good working order. The hand brakes shall be capable of being applied by a person on the ground and fitted with a device for retaining them in the applied position.

4.3 Overhead Crane Runways

4.3.1 A very serious hazard exists at points where an overhead crane runway crosses above a railway track, either inside or outside. The hazard lies in the possibility of crane loads or hook blocks striking locomotives or wagons while shunting is going on.

4.3.2 A system of interlocked signal lights, with one set visible to the crane operator and the other to the shunting crew, should be installed to guard against movement of the crane near the track while it is occupied. All personnel involved, especially crane operators, should be trained to respect the signals, without exception.

4.3.3 The signals can be actuated manually by a key switch, the key being kept by the area foreman. The signals should also be interlocked with a derail. Another method is to provide a zone power cut-off for the crane runways in the vicinity of the track, the cut-off being actuated by a key turnout point under the control of the area supervisor. Other methods that assure positive control of the crane movements may also be used.

4.3.4 Shunting crew should be required to get clearance from the area foreman before moving into the area, and the foreman should be responsible for keeping cranes clear until the shunting engine and wagons move out.

4.4 Precautions — Besides, the following precautions should be taken.

4.4.1 All equipment and appliances should be maintained in sound and safe operating condition.

4.4.2 The type of motive power for a plant railway is important to prevent accident and fire. Explosive gases are easily ignited by flames or sparks from fuel-fired locomotives. Where such gases may be present, electric, compressed air, or storage battery locomotive should be used.

4.4.3 Where ventilation is insufficient to keep the concentration of noxious and even toxic exhaust gases at a safe level, as in mines, the use of fuel-fired locomotives should be prohibited. However, since diesel engines can be equipped with devices to eliminate toxic gases from the exhaust, these types of locomotives may be used in some adequately ventilated mines (other than coal).

4.4.4 A major hazard with electric locomotive, in addition to that of sparking in explosives atmospheres, is the possibility of employees contact with the trolley. The trolley should be guarded at all points where employees may pass under it and should be high enough to prevent contact at all places.

4.4.5 Boilers of steam locomotives should be constructed in accordance with boiler regulations and inspected in accordance with relevant statutory requirements.

4.4.6 Diesel locomotives, which operate more quietly than steam locomotives, should be equipped with bells.

4.4.7 Deck walks should have hand rails around the outside.

4.4.8 Each locomotive should carry an extinguisher for oil fires.

4.4.9 An effective arrangement of spark arrestor shall be provided on steam locomotives to prevent hot cinders being thrown out.

5. RAILROAD VEHICLES

5.0 For railroad vehicles, including special machines, attention should be directed to the following.

5.1 Adequate wind screens and/or cab windows should be so positioned as to permit the maximum unobstructed all round field of vision for the driver. On occasions this may require the provision of supplementary windows, low down in the dash; for example, in vehicles standing high off the ground. For this purpose, clear plastic or similar material may have advantage.

5.2 Clear view of buckets, hooks and other attachments for the driver of mobile units.

5.3 Safe seating for the driver with controls suitably positioned for easy handling without the driver moving from his driving position.

5.4 Safe means of access to and from cab, to be clear of moving parts.

5.5 When steps or ladders are necessary, treads or rungs should be of adequate proportions, of non-slip character and these should be properly positioned with complementary hand-holds.

5.6 Adequate facilities for driving in reverse.

5.7 Cab sides and ends should be of robust construction and properly braced together to resist collapse and trapping of the driver in the event of collision and capsizing.

5.8 Automatic couplers may be used to eliminate the serious hazard involved when men go between either standard or narrow gauge wagons to insert or withdraw pins manually.

5.9 Hopper bottom wagons should be opened only with standard wagon wrenches. A special tool for closing the latches on bulk wagons eliminates the need for a man to go on top of the wagon from which he might fall. Rerailers should be provided for narrow gauge wagons; other means of rerailing wagons are generally dangerous.

5.10 For shunting locomotives the colour scheme yellow/black stripes should be followed. Yellow colour should be prominent.

6. MOVEMENT, LOADING AND UNLOADING OF WAGONS

6.1 Movement of Wagons

6.1.1 Moving of wagons by manual methods often result in accidents. The safest procedure is to use a shunting engine. Loose and fly-shunting inside the factory should be avoided.

6.1.2 If the ordinary hand wagon mover is used, there should be a shield around the bar so that the employee will not strike his hands or otherwise injure himself if the tool should slip. Pinchbars and other make shift tools should not be used to move wagons.

6.1.3 When a wagon is approaching a gradient, a workman should test the hand brake to make sure that it takes hold and that excess slack in the brake chain is taken up.

6.1.4 When a crane or hoist is used to move wagons with a cable running through a snatch block and if the cable breaks or if the hook pulls loose from a bar, workman may be struck by the flying rope. Wagons can be moved more safely by having a tractor pull than by means of a cable equipped with a hook especially made for the purpose.

6.1.5 When self-propelled, rider-operated wagon mover is used. This vehicle should have rubber-tyred wheels or steel rail wheels, both retractable so that it can run either on plant grounds or on rails. It should be fitted with standard couplers.

6.2 Loading and Unloading

6.2.1 Wagons stopped for loading or unloading should be protected against being accidentally moved by means of suitable wheel chokes or other suitable means. Standard railway red flags for day time and red

lights for night use furnish warnings to train crews. Signals should be placed between the rails at each end of the wagon accessible from either direction. Train crews should be strictly prohibited from coupling engines or wagons to any wagons so protected. The red signals should be removed only by the employees engaged in loading or unloading operations, when they are ready to release the wagons.

6.2.2 Bells and blinking warning lights should be installed along the tracks in working areas to warn personnel that shunting operations are going on. The warning lights and bells should be turned on by plant supervision before shunting operations are begun. For the purpose of warnings, only red and yellow lights shall be used.

6.2.3 It is the responsibility of the local plant management to clear employees from wagons before releasing the track to railway employees for shunting. Therefore, before wheel chokes and red flags are removed, plant supervision shall make sure that:

- a) gates, barriers or other obstructions are cleared from the track area;
- b) all plant personnel are cleared from railway wagons and track area;
- c) all overhead building cranes in the area being transferred have stopped operations and are clear of track vicinity;
- d) all bridge plates are removed from wagons;
- e) all counterweighted retractable service platforms are retracted and secured;
- f) all wagons moving equipment (cables, hooks, etc) is removed from wagons;
- g) all loading and unloading conveyors should be retracted from the wagons; and
- h) electrical connections given to thermal and refrigerated wagons are decoupled.

6.2.4 Tracks for loading or unloading flammable liquids or other dangerous materials should be demarcated and pointed suitably. For additional protection, turnout points should be provided with locks.

6.2.5 The consignee of a wagon load shipment of material or merchandise after unloading of the wagon should clean it before releasing it to the railway that serves the establishment. Pieces of grating and dunnage, nails, and strapping left loose in the wagon are serious hazards to railway employees and others who may have to enter it later.

7. OTHER SAFE PRACTICES

7.1 It is vital that transportation personnel as well as all other employees, such as inspection staff, observe safe practices. They should be guided by same safety rules as are observed by all large railroad system. When plant railway safety problems arise, help and suggestions should be sought from the safety men and operating officers of a plant's connecting railway line.

7.2 Safety meetings and other educational activities should be used to inform plant personnel about railway hazards.

7.3 It is not possible to include all the safe practices required to be observed by workers for the safe operation of plant railways. However, a few of the more important ones are given below for instructions to the workers and shunting crew employed for the plant railways.

7.3.1 Stop and look both ways before crossing any track.

7.3.2 Expect trains or wagons to move at any time, on any track, in either direction.

7.3.3 Stop over rails when crossing tracks. Never step, walk, or sit on any rail.

7.3.4 Never go between moving wagons (or wagons that may move) for the purpose of adjusting couplers or for any other purposes.

7.3.5 Give a hand or lamp stop signal and receive an acknowledgement of the signal before going between standing engines or wagons.

7.3.6 To close a box wagon door, place one hand on the door handle and the other on the back end of the door.

7.3.7 Step down from wagons — do not jump.

7.3.8 Never attempt to ride the leading foot-board of an engine.

7.3.9 While crossing the road inside the factory premises, the loco drivers should whistle and look both ways before crossing the road.

7.3.10 While changing the points through the point lever, the point should be inspected physically to avoid any gap in between the point which can result in an accident.

7.4 The railway track should be kept clean and no oil should be allowed on the track.

7.5 Overhead Power Lines — These shall be designed, installed and maintained as per IS : 5613*.

*IS : 5613 Code of practice for design, installation and maintenance of overhead powerlines.

(Part I/Sec 1)-1970 Lines up to and including 11 kV, Section 1 Design.
(Part I/Sec 2)-1971 Lines up to and including 11 kV, Section 2 Installation and maintenance.

(Part II/Sec 1)-1976 Lines above 11 kV and up to and including 220 kV, Section 1 Design.

(Part II/Sec 2)-1976 Lines above 11 kV and up to and including 220 kV, Section 2 Installation and maintenance.

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

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